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First records of *Anthopleura nigrescens* (Verrill, 1928) and *Telmatactis panamensis* (Verrill, 1869) (Cnidaria, Anthozoa, Actiniaria) from Parque Nacional Coiba, Pacific coast of Panama

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Abstract

We report two species of sea anemones, *Anthopleura nigrescens* (Verrill, 1928) and *Telmatactis panamensis* (Verrill, 1869), for the first time from Parque Nacional Coiba, a large, protected area in the Pacific off Panama. In addition, we describe the external anatomical taxonomic characters and provide images of live specimens of each species. The number of sea anemones species known for Panama is updated to 57. This work constitutes the first study in the documentation of sea anemones of Coiba Island.

Keywords

Benthic invertebrate fauna, distribution, tropical Eastern Pacific, rocky intertidal, sea anemones

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Introduction

Marine invertebrate biodiversity on both the Pacific and Atlantic coasts of Panama is very high, although many groups remain poorly known. Among these groups are the sea anemones (Cnidaria, Anthozoa, Actiniaria), a small but very interesting group due to their evolutionary plasticity that has allowed them to inhabit numerous marine environments. Strictly, sea anemones include those cnidarians classified within the order Actiniaria, although some authors use "sea anemone" in a broader sense (*sensu lato*) to refer to other animals classified in the orders Corallimorpharia (mushroom anemones) and Zoantharia (carpet anemones), as well as those of the subclass Ceriantharia (tube anemones) (Fautin and Daly 2009). After the studies by Carlgren (1924), Cubit and Williams (1983), Garese et al. (2009), and Swain (2009a, 2009b), as well as some records in the World Register of Marine Species (WoRMS 2022) and the Global Biodiversity Information Facility (GBIF 2022) databases, 20 species of sea anemones *sensu lato* are known from the Pacific coast of Panama and 36 from the Atlantic side,

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for a total of 56 species of sea anemones known from the country. However, many areas remain poorly explored and their biodiversity is unknown.

Coiba Island, in the tropical Eastern Pacific, off the southeast coast of Panama, is the largest island of an archipelago of smaller islands and islets, which together constitute the largest marine protected area in the country and under consideration as a UNESCO World Heritage Site. The site contains several marine habitats including coral reefs, sandy bottoms, rocky intertidal platforms, and mangrove intertidal flats, and maintains exceptionally high levels of endemism (Claudino-Sales 2019). About 20 species of scleractinian corals, two species of hydrocorals, and 34 species of octocorals, are among the cnidarians that have been reported from the Coiba Islands (Guzmán et al. 2004), but no species of sea anemones have been reported from the area so far.

Here we document the first records of two actiniarian species, *Anthopleura nigrescens* (Verrill, 1928) and *Telmatactis panamensis* (Verrill, 1869), from the Parque Nacional Coiba. These species are taxonomically diagnosed, and images of living specimens are provided. *Anthopleura nigrescens* is commonly distributed in the Indo-Pacific (Dunn 1974; Rodríguez et al. 2022a), but its closest previous records are from the coast of Costa Rica (Acuña et al. 2012a) about 440 km north, and in the Galapagos Islands (Fautin et al. 2007), about 1300 km southwest. It has been shown that this species can be a source of biologically active substances that have potential activity against pathogenic microorganisms (Alvarado et al. 2014; Borbón et al. 2016), and a new actinoporin, the nigrelysin, has even been discovered by studying this species (Alvarado et al. 2019). This species is also reported from Panama for the first time.

Telmatactis panamensis is distributed from the Gulf of California, Mexico, to the coast of Ecuador and the Galapagos Islands (Fautin et al. 2007; Rodríguez et al. 2022b). This species has previously been reported off the coast of Panama, but this is the first record from Parque Nacional Coiba. The record of *A. nigrescens* increases the number of known sea anemones for Panama to 57. This study is the first and constitutes the beginning in the documentation of the actinofauna in the Parque Nacional Coiba.

Methods

We collected 23 specimens of *Anthopleura nigrescens* in the rocky intertidal zone of Isla Jicarita on February 17, 2022, and 8 specimens of *Telmatactis panamensis* in the intertidal zone of the inner part of Isla Canales de Afuera (Fig. 1). We collected the specimens by hand, using a spatula. The collected specimens were transferred to the Laboratorio de Ecología Marina y Oceanografía of the Estación Científica Coiba (on Coiba Island)

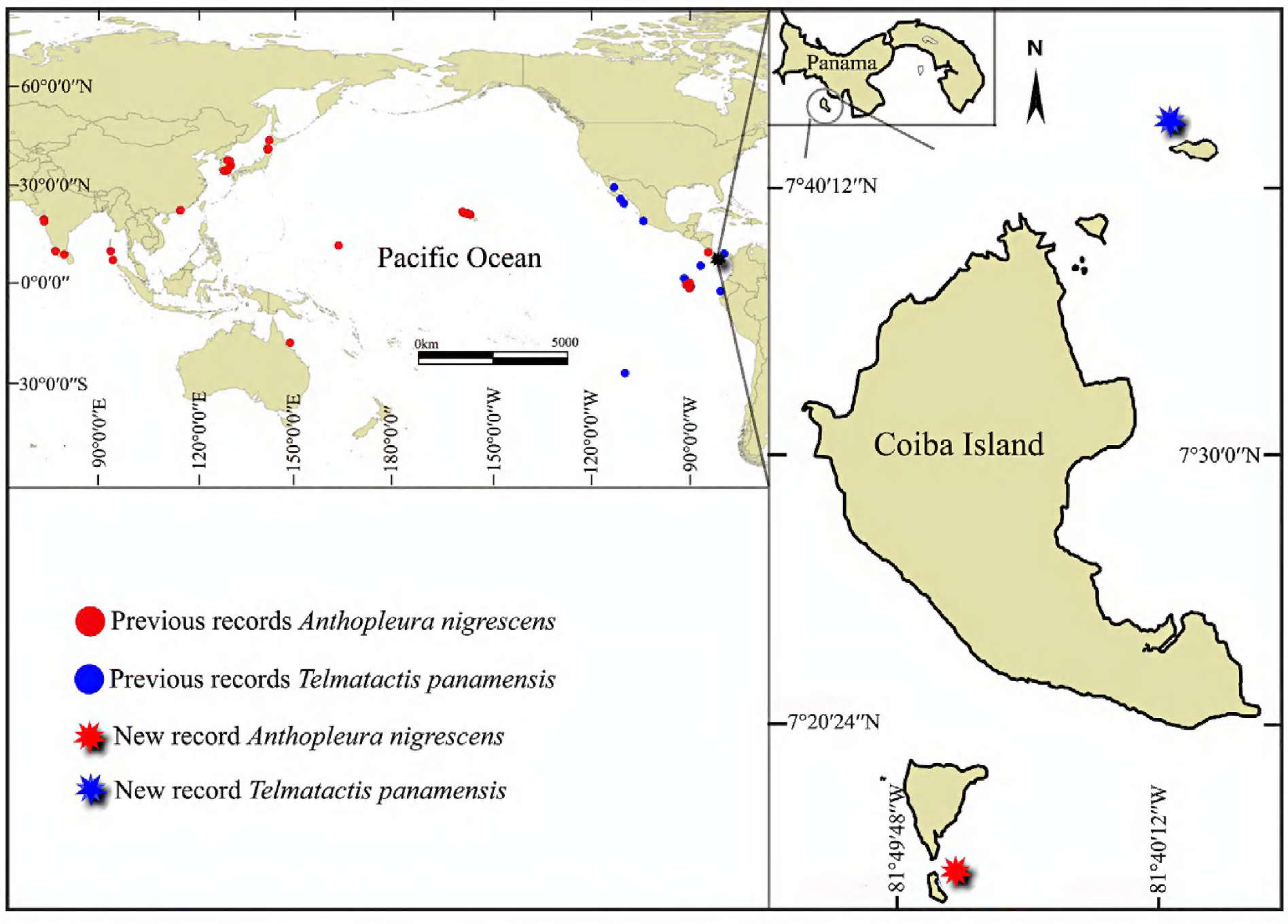

Figure 1. Map showing the locations of previous report of *Anthopleura nigrescens* (red dots), *Telmatactis panamensis* (blue dots), and their new records (asterisk) in Parque Nacional Coiba, Panamá.

and photographed to record their color in life. Samples were relaxed in 5% $MgCl_2$ and fixed in 10% seawater formalin. We preserved some individuals directly in 96% ethanol for potential molecular studies. We studied the external diagnostic characteristics of live specimens in vivo and in preserved material. All measurements were made on preserved specimens. Some specimens were examined at the Laboratorio de Biología de Cnidarios (LABIC), Universidad Nacional de Mar del Plata (Argentina). The specimens are deposited in the Estación Científica Coiba.

Results

Order Actiniaria Hertwig, 1882
Suborder Enthemonae Rodríguez & Daly in Rodríguez et al., 2014
Superfamily Actinioidea Rafinesque, 1815
Family Actiniidae Rafinesque, 1815
Genus *Anthopleura* Duchassaing de Fonbressin & Michelotti, 1860

***Anthopleura nigrescens* (Verrill, 1928)**
Figure 2A, B

New record. PANAMA – **Parque Nacional Coiba** • Isla Jicarita; 07°13′20.64″N, 081°48′13.32″W; 17.II.2022; F.H. Acuña leg.; AC3, AC4.

Identification. In life, oral disc flat, smooth, dark gray-brown to black, with darker radial lines marking mesenterial insertions; mouth small, round, same color as oral disc (Fig. 2A). Tentacles arranged in four or five cycles (numbering about 48–90 in examined specimens), conical, smooth, contractile, inner cycles longer than outer ones, light gray with circular, beige, round marks on their oral face (Fig. 2A). Column cylindrical, 7–11 mm in diameter and 6–8 mm in height, blackish, with endocoelic longitudinal rows of prominent verrucae extending from margin to limbus (Fig. 2B); verrucae simple,

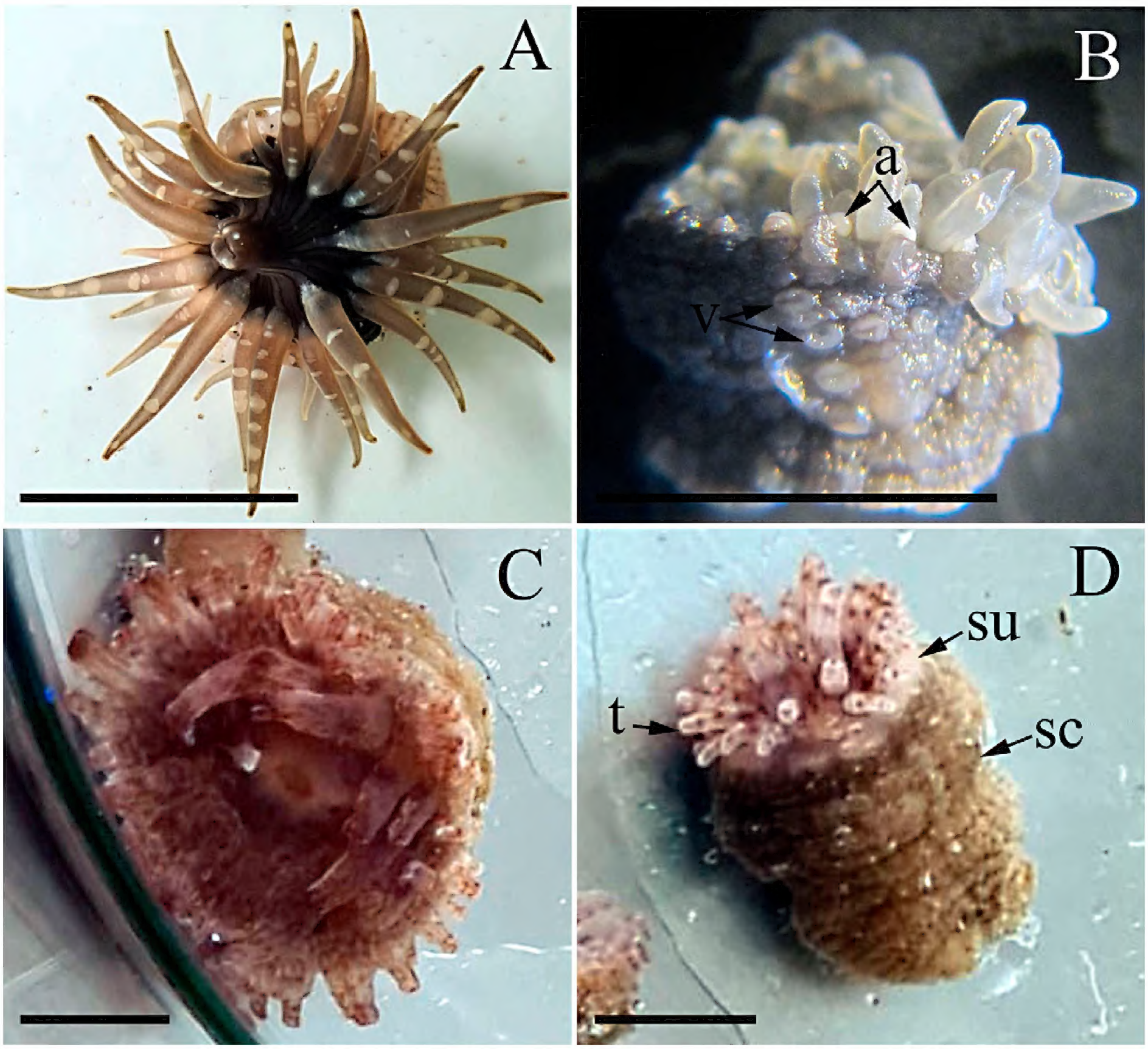

Figure 2. A, B. *Anthopleura nigrescens*: (**A**) oral view, detail of oral disc and tentacles; (**B**) lateral view, detail of verrucae and acrorhagi. **C, D.** *Telmatactis panamensis*: (**C**) oral view, detail of oral disc and tentacles; (**D**) lateral view, detail of scapulus and scapus. Legend: a = acrorhagi, sc = scapus, su = scapulus, t = tentacle, v = verrucae. Scale bars = 10 mm.

gray to beige. Some marginal protuberances with white-tipped acrorhagi on their oral face (Fig. 2B). Limbus beige. Pedal disc well developed, beige. For further information on external and internal anatomical details and cnidae, see Dunn (1974).

Remarks. All observed anatomical characteristics agree well with descriptions of this species (e.g. Dunn 1974; Fautin et al. 2007; Acuña et al. 2012a). The color of the oral disc, tentacles, and column is very consistent with *A. nigrescens*.

Natural history. Individuals were found in the rocky intertidal under rocks, but the species has also been reported in shallow subtidal zones (Dunn 1974; Fautin et al. 2007; Acuña et al. 2012a). This species is an opportunistic polyphagous predator, and its diet includes mollusks, crustaceans, annelids, insects, and eggs, among other prey (Quesada et al. 2014). This species lacks zooxanthellae (Dunn 1974). It has been reported to be dioecious, but it is also capable of reproducing asexually by longitudinal division (Dunn 1974; Fautin et al. 2007). *Anthopleura nigrescens* has been observed to exhibit possible predation escape behavior, from the aeolid nudibranch *Herviella* sp., by detaching its pedal disc from the substrate when in contact with the mollusk, and eventually tilting and falling away from the predator (Rosin 1969).

Distribution. Japan (Uchida 1938), India (Parulekar 1968), Hawaii (Dunn 1974), Marshall Islands (Cutress and Arneson 1987), Hong Kong (England 1987, 1992), Korea (Song and Lee 1998), Ecuador (Fautin et al. 2007), Costa Rica (Acuña et al. 2012a), and the Pacific coast of Panama (this study).

Superfamily Metridioidea Carlgren, 1893
Family Andvakiidae Danielssen, 1890
Genus *Telmatactis* Gravier, 1916

***Telmatactis panamensis* (Verrill, 1869)**
Figure 2C, D

New record. PANAMA – **Parque Nacional Coiba** • Isla Canales de Afuera; 07°41′49.92″N, 081°37′28.56″W; 16.II.2022; F.H. Acuña leg.; AC1, AC2.

Identification. In life, oral disc flat, smooth, wide, light orange to brown, spotted with scattered beige marks; mouth small, beige at the periphery (Fig. 2C). Tentacles short, arranged in 4 or 5 cycles (48–96 in number), blunt, slightly swollen at the tips, smooth, contractile, inner cycles longer than outer ones, light brown to orange, sometimes with purple flashes, and W-shaped darker marks at their bases (Fig. 2C). Column cylindrical, 5–20 mm in diameter and 5–25 mm in height, divided into a scapulus and scapus. Scapulus short, smooth, pale orange, translucent; scapus smooth but rough in appearance due to the cuticle and particles of sand that covers it, pale orange to beige or brownish (Fig. 2D). Base with a faint pedal disc, irregular in shape, orange. White acontia. For further information on external and internal anatomical details and cnidae, see Carlgren (1951) and Fautin et al. (2007).

Remarks. All observed anatomical characteristics agree well with those described for *T. panamensis* (e.g. Fautin et al. 2007; Acuña et al. 2012b). Furthermore, this is the only species of *Telmatactis* currently known on the Eastern Pacific coast. However, Fautin et al. (2007) suggested that due to its great variability in coloration and other characters, other species are possible in the region.

Natural history. This species was found in the rocky intertidal under pieces of rocks, but it has also been reported to depths of 35 m (Fautin et al. 2007; Acuña et al. 2012b).

Distribution. Panama (Verrill 1869), Chile (Carlgren 1922), Mexican Pacific coast (Carlgren 1951), Galápagos Islands (Fautin et al. 2007), Costa Rica (Acuña et al. 2012b).

Discussion

Certainly, the diversity of some groups of marine invertebrates in the Parque Nacional Coiba has been studied, such as polychaetes (e.g. López et al. 2002; Aguado and San Martín 2006), scleractinian corals and octocorals (e.g. Guzmán et al. 2004), and echinoderms (e.g. Alvarado et al. 2012), among others. However, many other groups, such as sea anemones, remain poorly known. Therefore, future studies are necessary to build a detailed inventory of these organisms.

It is very likely that sea anemones have been reported from the coast of Panama, or nearby locations such as Costa Rica (Acuña et al. 2012a, 2012b) and the Galapagos Islands (Fautin et al. 2007), also occur in Parque Nacional Coiba. However, a high degree of endemism has been documented in the area (Claudino-Sales 2019). The possibility exists of finding other sea anemone species that have not yet been described, as cnidarians are one the least studied groups in the region.

Like *Anthopleura nigrescens*, other species of sea anemones also have a circum-Pacific distribution, such as *Actinernus elongatus* (Hertwig, 1882), *Liponema brevicorne* (McMurrich, 1893), or *Peachia quinquecapitata* McMurrich, 1913 (Rodríguez et al. 2022c, 2022d, 2022e). However, there are also several examples where species once thought to have a widespread distribution were shown to be composed of several geographically restricted cryptic species (e.g. Grajales and Rodríguez 2016; Spano et al. 2018; Wilding and Weedall 2019; Titus et al. 2019). Therefore, phylogeographic study of widely distributed sea anemone species would be useful to elucidate the causes of its wide distribution and its degree of genotypic variability. Likewise, future studies should include aspects of their biology, such as their reproduction, feeding, ecology, genetics, and associations with other organisms.

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Authors' Contributions

Conceptualization: FA. Data curation: FA. Formal analysis: REGM, FA. Funding acquisition: EDF. Investigation: AG, FA. Methodology: FA, REGM. Visualization: AG, REGM. Writing – original draft: FA, AG. Writing – review and editing: REGM.

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